

IMMATURE STAGES OF *BALIOMORPHA PULCHRIPENNE*
(TILLYARD) FROM AUSTRALIA, WITH COMMENTS ON
GENERIC PLACEMENT (TRICHOPTERA:
HYDROPSYCHIDAE)

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ABSTRACT: The larva and pupa of *Baliomorpha pulchripenne* (Tillyard) from southeastern Australia are described, and generic placement of the species is discussed. The close affinity with the larva of the neotropical species *Macronema variipenne* Flint & Bueno is emphasised. However, differences between larvae of the Australian and the South American species support the transfer of Australian species to a separate genus.

The subfamily Macronematinae is widely distributed, with species recorded from all continents. Australian species have until recently been referred to the genera *Aethaloptera* Brauer and *Macronema* Pictet (Neboiss 1983). The genus *Aethaloptera* is represented by a single species, *A. sexpunctata* (Kolenati), which has only been recorded from north Queensland and is clearly a northern element of the Australian fauna (Barnard 1980). The type species of the genus *Macronema* is *M. lineatum* Pictet from Brazil. The larva of another neotropical species, *M. variipenne* Flint & Bueno, has recently been described by Flint and Bueno (1982). These authors, after consideration of both adult and larval morphology, redefined the genus *Macronema*, restricting it to twenty-six listed neotropical species. They resurrected the genus *Macrostemum* Kolenati to accommodate additional neotropical species, as well as all species from North America, Africa, Asia and Australia, which had previously been referred to the genus *Macronema*. Neboiss (1984), however, has now revised the taxonomy of Australian species, and has established the genus *Baliomorpha* to accommodate them. In addition he has recorded from northern Australia the species *sandersi* McLachlan, previously only known from New Guinea, and has referred it to the genus *Macrostemum*.

Larvae of Australian Macronematinae have not been formally described, although whole larvae have been figured as 'Macronematinae' (Riek 1970) and 'Genus J' (Cartwright & Dean 1982). Korboot (1964) has described and figured a larva which she identified as *Macronemum torrenticola* Korboot. However, her figures clearly show that she has misassociated the larva, which is in fact a species of the subfamily Dipletroninae. The larva of *B. pulchripenne* (Tillyard) from Victoria has now been bred through to the adult, and is described below, thus allowing some comment on generic placement of Australian species.

SYSTEMATICS

Baliomorpha pulchripenne (Tillyard 1922)

Figs 1A-E, 2A-E

1922 *Macronema pulchripenne* Tillyard, p. 83, pl. 24A, fig. 3.

1953 *Macronemum pulchripenne* (Tillyard); Mosley & Kimmins, p. 313, fig. 220.

1963 *Macronema pulchripenne* Tillyard; Fischer, p. 194.

1984 *Baliomorpha pulchripenne* (Tillyard); Neboiss, p. 128, figs 1-3, 43, 44.

DISTRIBUTION: *Baliomorpha pulchripenne* has only been recorded from Victoria and New South Wales, and is apparently restricted in distribution to southeastern Australia.

DESCRIPTION: Larva. Length 20 to 22 mm, width 2.5 mm. Head and thoracic sclerites golden-brown. Head slightly longer than wide (Fig. 1B). Frontoclypeus with anterior margin concave, somewhat asymmetrical; no prominent knobs near anterolateral corners. Setae on frontoclypeus short, restricted to anterolateral corners and one or two near apex. Genae with numerous short, sharp setae and scattered long setae on anterior two-thirds only. Ventral surface of head with two rows of medium length setae near anterior margin (Fig. 1C). Stridulatory grooves absent. Anterior ventral apotome not fully delimited, ecdysial line absent on right side. Posterior ventral apotome very small. Labrum hairy on anterior half, without anterolateral brushes. Mandibles short, robust, without well developed teeth (Fig. 1E). Pronotum with transverse sulcus (Fig. 1A); numerous setae anterior to sulcus. Prosternite crescent-shaped with mesal projection on anterior margin; posteriorly a smaller triangular sclerite, with lateral angles extended into blunt arms (Fig. 2A). Mesonotum and metanotum with numerous setae, both short and long. Thoracic gills absent. Foretrochantin blunt, with numerous setae. Fore coxa long, also with numerous setae (Fig. 2B). Femur broad, with ventral row of stout peg-like setae; palmate setae not present on femur. Tarsus less than half length of tibia. Mid and hind legs with coxa, trochanter and femur elongate, all segments with numerous long setae, and without short peg-like setae (Fig. 2C). Tarsus without apico-dorsal spine. Gills on abdominal segments 1 to 7; each filament feather-like with numerous lateral branches (Fig. 1A). Gill formula as in Table 1. Abdominal segments clothed with short setae. Scattered long setae dorsally, and a cluster of

TABLE 1
SCHEMATIC GILL DIAGRAM OF THE LATERAL ASPECT OF MESO- AND METATHORAX
AND FIRST EIGHT ABDOMINAL SEGMENTS

	Meso	Meta	1	2	3	4	5	6	7	8
<i>Baliomorpha pulchripenne</i> Australia			D	DD	DD	DD	DS	DS	DS	
<i>Macronema variipenne</i> Neotropics (After Flint & Bueno 1982)			D	DD	DD	DD	SS	SS	S	

S = single central stalk

D = two S-type stalks with adjacent bases

medium length setae posterior to the gill filaments. Sternum 9 with numerous long setae; centrally a pair of small sclerites bearing fewer than ten short, stout spines (Fig. 1D). Anal gills absent. Anal prolegs long and slender, not bent at midlength. Anal claws slender and curved.

Pupa. Length about 10 mm. Labrum with anterior margin semicircular, densely setose in anterior half. Mandibles membranous. Antennae very long; looped, not coiled around apex of abdomen. Anterior and posterior hook plates on abdominal segments 3 and 4, anterior hook plates only on abdominal segments 5 to 8 (Fig. 2E). Abdomen with apical processes present, but not well developed (Fig. 2D). Apex of abdomen with numerous long setae, predominantly ventral. Pupal shelter 15 to 20 mm long, ovoid. Constructed from small fragments of leaves, roots, and other vegetable matter.

HABITAT: Larvae and pupae have been collected from matted roots along the margins of small, fast flowing, forest streams. This in part explains the fact that very few specimens have been collected during stream surveys which have relied upon traditional collecting techniques.

MATERIAL EXAMINED: Victoria—4 pupae, 10 larvae, Cement Creek, Warburton East, 24 Nov. 1981 (Cartwright, Dean); 1 ♀, 1 pharate ♂, 2 pupae, Cement Creek, Warburton East, 8 Dec. 1981 (Cartwright, Dean); 1 larva, Starvation Creek, 10 Mar. 1981 (Cartwright, Dean); 1 larva, Yarra River, O'Shannassy junction, 10 May 1979 (Cartwright, Dean); 1 larva, Buller Creek, Mirimbah, 2 Nov. 1981 (Dean). All specimens in author's collection.

DISCUSSION: Although *pulchripenne* is at present the only Australian species of *Baliomorpha* for which the larva has been described, I have examined unassociated larvae of two other species from eastern Australia. The similarities between the larvae of these three species and *M. variipenne* from central and South America are striking. Features in common include the absence of stridulatory grooves on the ventral surface of the head capsule, the absence of an ecdysial line on the right side

of the anterior ventral apotome, the short, robust mandibles, the absence of antero-lateral brushes on the labrum, the unmodified gena, without a carina, the feather-like gills on abdominal segments 1 to 7, the absence of thoracic gills, and the long slender form of the anal prolegs. In addition pupae of both *B. pulchripenne* and *M. variipenne* possess posterior hook plates on abdominal segments 3 and 4, long looped antennae, and general similarities in the form of the labrum and mandibles. While the suggestion of Flint and Bueno (1982) that species of *Macronema* from North America, Africa and Asia should be transferred to the genus *Macrostemum* is supported by available larval descriptions (Lepneva 1964, Wiggins 1977, Scott 1983), this is certainly not the case with the Australian species. In fact, on the evidence from the larvae, the Australian species and the South American species of *Macronema s. str.* represent a monophyletic unit within the subfamily Macronematinae. Species from the two geographical regions share, for example, the loss of the ecdysial line on the right side of the anterior ventral apotome, which is obviously a derived character. Notwithstanding the similarities detailed above, there are differences between Australian larva and the larva of *M. variipenne*. Some of these differences are listed in Table 2, and provide supporting evidence for the decision by Neboiss (1984), based on adult morphology, to establish the new genus *Baliomorpha* for Australian species.

Distribution of sister groups in South America and Australia has been reported for several cool-temperate aquatic insect groups, including stoneflies (Illies 1969), chironomid midges (Brundin 1966), and leptophlebiid mayflies (Pescador & Peters 1979). These distributions have been explained in terms of transantarctic dispersal prior to fragmentation of Gondwanaland, and the same dispersal route can satisfactorily explain present distributions of *Macronema* and *Baliomorpha*. This presupposes that ancestral species were cool temperate, and that invasion of tropical regions in South America and Australia/New Guinea has been relatively recent. The great diversification of species in tropical South

IMMATURE *BALIOMORPHA PULCHRIPENNE*

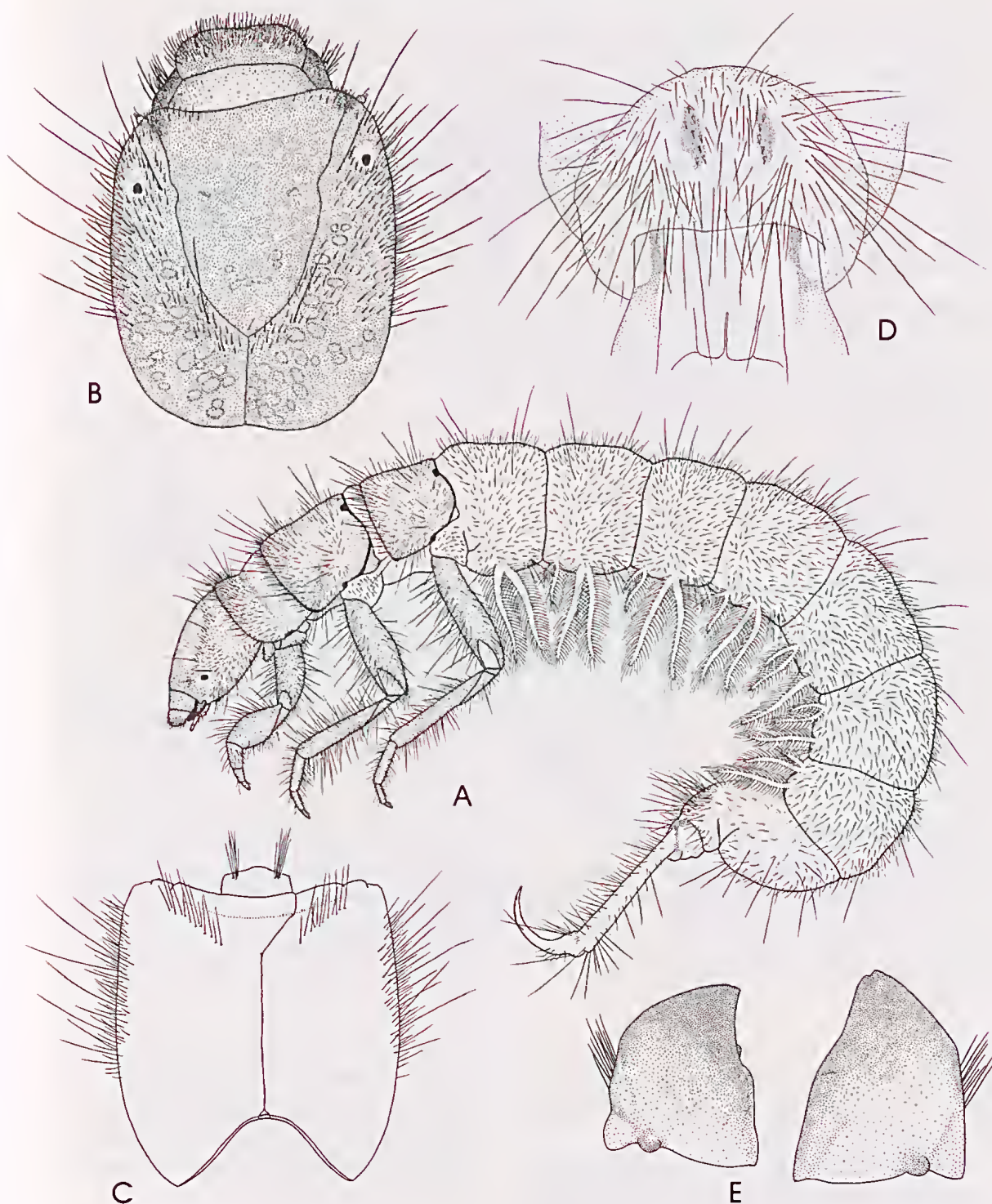


Fig. 1—*Baliomorpha pulchripenne* (Tillyard), larva. A, whole larva. B, head, dorsal. C, head, ventral. D, ninth abdominal segment and base of prolegs, ventral. E, mandibles.

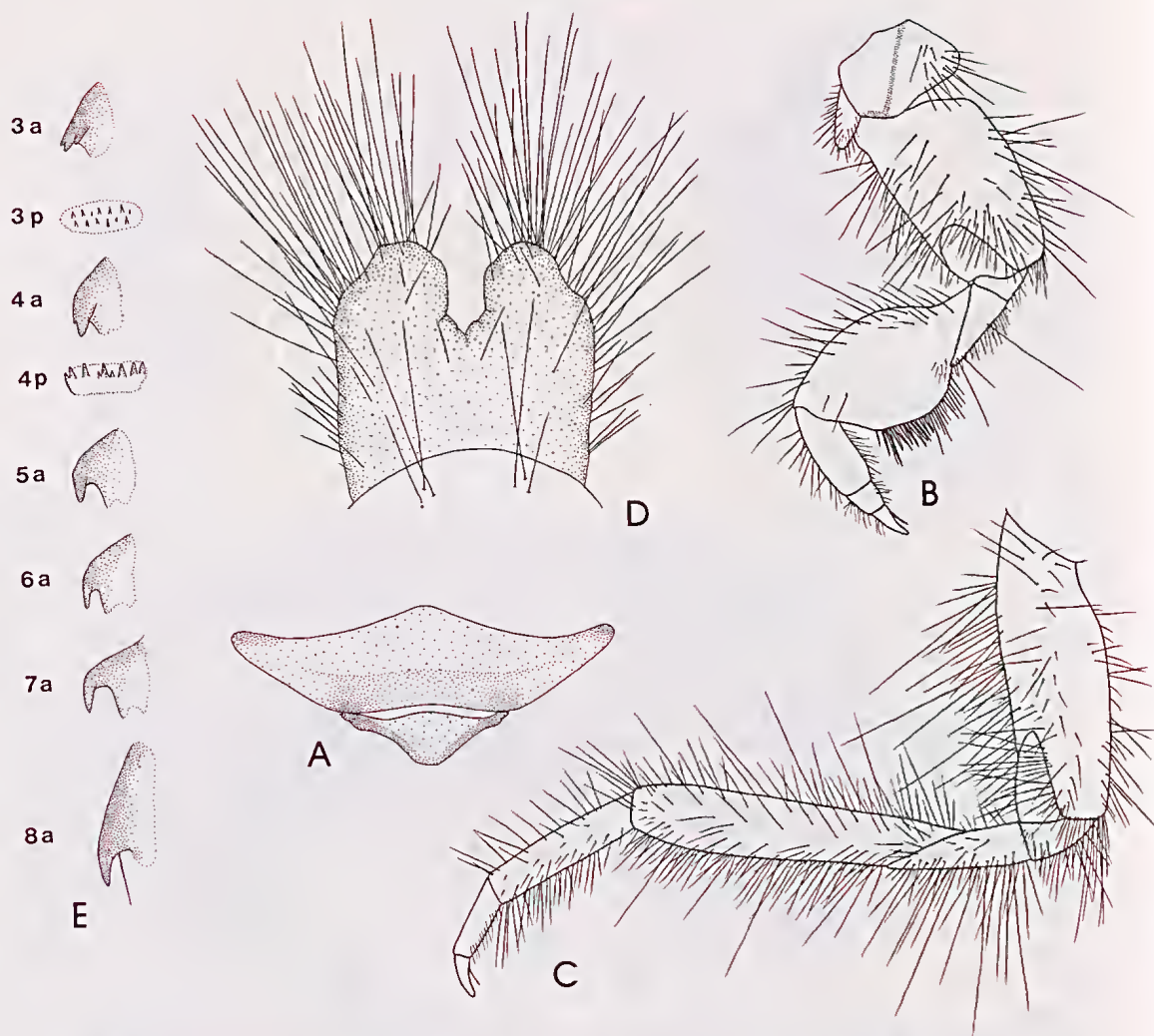


Fig. 2—*Balimorpha pulchripenne* (Tillyard), larva and pupa. A, larval prosternum. B, larval fore-leg. C, larval mid-leg. D, apex of pupal abdomen, dorsal. E, pupal hook plates, abdominal segments 3 to 8. a, anterior; p, posterior.

America is perhaps a consequence of the suitability of aquatic habitats which support prolific macrophyte growth. Flint and Bueno (1982) have reported that larvae of *M. variipenne* are generally found among the roots and leaves of water plants.

Neboiss (1984) has also recorded a single species of *Macrostemum* from northern Australia, and has drawn attention to the fact that *M. saundersi* (McLachlan) and several other New Guinea species form a natural group, which differs in several adult characters from species of *Macrostemum* in North America, Asia and Africa. While not prepared to formally transfer the New Guinean and Australian species to a new genus, he does recognise that this could ultimately be required. Larvae

of the species from New Guinea and Australia are unknown, which is unfortunate since, as has been shown above, larval stages are particularly useful for clarifying generic relationships. Historically larval morphology has been neglected in Trichoptera systematics, and the inclusion of larvae in future taxonomic studies should be encouraged.

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TABLE 2

DIFFERENCES BETWEEN THE LARVAE OF AUSTRALIAN SPECIES
OF *Baliomorpha* AND *Macronema variipenne*
FROM THE NEOTROPICS

	<i>Baliomorpha</i> Australia	<i>M. variipenne</i> Neotropics (After Flint and Bueno, 1982)
FRONTOCLYPEUS prominent knobs at anterolateral corners	absent	present
FORELEGS femur	broadened	not broadened
ventral setae on femur	simple, robust	palpate
MID- AND HIND LEGS short, peg-like setae on trochanter, femur and tibia	absent	present
apico-dorsal blade-like seta on tarsus	absent	present
ABDOMINAL GILLS formula on segments 5-7	DS, DS, DS	SS, SS, S
ANAL PROLEGS	not jointed in middle	jointed in middle

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